STATE & PRIVATE FORESTRY
FOREST HEALTH PROTECTION
SOUTH SIERRA SHARED SERVICE AREA

Report SSSA 13-4

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To: **Kathy Hardy, Forest Supervisor, Eldorado National Forest**
Patricia Trimble, Georgetown District Ranger, Eldorado National Forest

Subject: **Assessment of tree mortality in Quintette and Hartless Projects 2012**

Summary. *On December 11, 2012 Forest Health Protection visited several recently treated units on Georgetown Ranger District that observed legacy-sized ponderosa pines fading. Dana Walsh, District Silviculturist and Patricia Trimble, District Ranger accompanied FHP to units on Quintette and Hartless projects. This report covers FHP observations and group discussions during the service field visit.*

During the years of 2008-2011, Georgetown Ranger District, Eldorado National Forest conducted two thinning prescriptions followed by prescribed burns in Quintette and Hartless units. Fading of large diameter ponderosa pines within treated areas did not show up until late summer-fall of 2012. Only pines, 20 inches and greater, were successfully mass-attacked by bark beetles in burned units; non-burned units did not have mortality nor attacks. The district wanted to understand: 1) why trees died in burned units compared to unburned units, 2) why only large diameter trees were dying, and 3) will green trees currently infested with red turpentine beetles suffer the same fate? Forest Health Protection was requested by Dana Walsh (district silviculturist) to visit several treated units in both projects and assess the situation.

Observations

Quintette and Hartless projects are located about mid-elevation (3500-4500 feet), mixed conifer-pine type sites. About one year after thinning in delineated units, project sites were prescribed burned (pile burning with "creepy burn"). Quintette was thinned in various parts from 2007-2008, followed by prescription burns in 2009; Hartless Ridge was thinned in 2009, burned fall 2011. Both projects are very similar in treatments and residual stocking. Hartless sits at about 4500 feet on flatter ground, while Quintette has many units that slope down to creeks or bottoms around 3500-4000 feet. "Creepy

Figure 1. *December 2012, Quintet unit. Bole scorch on residual trees appeared minimal.*

burns" are pile fires that are allowed to expand beyond the stack and onto the ground, creeping along the duff as low intensity burns. Scorch around the bases of most trees at both projects appeared minimal (1-5%) and no crown scorch was noted (see Figure 1). Only large ponderosa pines (>20 inches) and two large sugar pines were killed by bark beetles in Quintette, no fading trees were noted in Hartless.

There are site differences between Quintette and Hartless that may provide explanation for tree mortality. First, Quintette sits 1000 feet lower than Hartless where snow may not remain throughout the winter. On the largest ponderosa pines in Quintette units, bole scorch did rise about 5-10 feet along one side and was followed by red turpentine beetle attacks (see Figure 2). These trees were estimated to have been attacked early spring 2012 and were just fading by November. A notable thing about most recent faders is location: many sat on at least 10 degree slopes, some were right along a steep road grade. Another major difference is the higher amount of past beetle activity noted around Quintette: older dead beetle-killed trees, estimated two to four years ago. Forest Health Monitoring Annual Aerial Detection surveys of this area since 2010-2011 show numerous polygons of pine mortality at the lower elevations compared to fir mortality around higher sites.

Discussion

According to Fettig et al. (2008), prescribed burns significantly increase the risk for subsequent bark beetle attack compared to thinned-only stands. Highest risk is within the first five years, with the first two years when a majority of attacks potentially occur (Hood et al. 2010, Youngblood et al. 2009). Risk for residual trees can also be estimated by beetle activity during and after fire (Fettig and McKelvey 2010). Mature ponderosa pines are more fire-resistant with thick bark, larger girth, and high crowns but they also have higher duff accumulations at the base which increases likelihood for longer residence time (Hood et al. 2010). These lingering burns can prolong recovery and increase vulnerability to insect attack. The upslope side of trees where higher amounts of litter can build, may have burned hotter than trees along flat ground where duff is distributed more evenly was another possibility as to the losses at Quintette. From outward appearances at Quintette, the burns around the base may not have appeared lethal but factored in with slope, drought, and frequent beetle activity in the area, risk for attack was much higher than Hartless. Closer observation by Dana and Patricia confirmed that the prescribed burns burned hotter than anticipated due to duff accumulation.

Figure 2. *Examination of bole scorch and red turpentine beetle activity on recently dead ponderosa pine.*

Red turpentine beetles are not aggressive, and typically work in conjunction with other *Dendroctonus* to kill trees. They do respond quickly to injury or damaged trees, attacking specific areas where injury occurred. Their presence on trees is usually an indicator of some physiological stress or damage that leads to subsequent attack by western or mountain pine beetles soon afterward. However, trees can survive multiple and heavy RTB attacks. Burned ponderosa pines at both Quintette and Hartless sites were heavily attacked by RTB, but additional factors most likely contributed to mortality. Trees with signs of RTB should be monitored following prescribed burns and new attacks noted in years following burn. Probability of mortality is based on additional factors rather than just RTB presence (Smith and Cluck 2011).

Drought may have hampered efforts by residual trees to acclimate after the disturbance of prescribed fire. Despite precipitation overload in 2010-2011, winter 2011-2012 was abnormally below average. Water stress compounded with burn and insect attacks may have been too much for recovering trees. Scheduling a burn to coincide with adequate rainfall is near impossible, but managers can take other precautions to reducing overall tree stress.

To protect legacy pines while continuing with restoration activities, it was decided that the district would rake around selected trees before burns to increase survivability and significantly decrease mechanical injury. Based on observations and effects of the prescribed treatments on Quintette and Hartless, prior identification of high-value trees followed by raking before prescribed burns would be the most prudent course of action. Raking has been shown to reduce surface fuels and reduce beetle attack on sugar pines (Nesmith et al. 2010). Raking prescriptions may vary per location, but some removal of duff loads against selected tree bases should reduce burn injury. The district may also want to reference FHM aerial detection surveys before conducting prescribed burns to monitor surrounding bark beetle activity, and help gauge appropriate timing for treatments. Post-treatment monitoring is strongly encouraged, as in this case to understand if adjustments to future prescriptions are necessary.

Please do not hesitate to contact FHP if you have any further concerns or need more information. We are happy to provide assistance.

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